**MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY**

**KOROGWE TEACHERS’ COLLEGE**

**ADVANCED CERTIFICATE OF SECONDARY EDUCATION EXAMINATION**

**PRE NATIONAL EXAMINATION**

**132/2 CHEMISTRY 2**

**Time: 3 Hours FRIDAY, 22ND APRIL 2022**

**Instructions**

1. This paper consists of a total of **six (6)** questions.
2. Answer any **five (5)** questions.
3. Each question carries **twenty (20)** marks.
4. Mathematical tables and non-programmable calculators may be used.
5. Cellular phone and any unauthorized materials are **not** allowed in the examination room.
6. Write your **examination number** on every page of your answer booklet(s).
7. For calculations you may use the following constants:

Gas constant, R = 8.314 J mol-1 K-1 or 0.0821 atm L mol-1 K-1

GMV = 22.4 dm3

1litre = 1 dm3 =1000 cm3

Standard temperature 273 K

Standard pressure =760 mmHg = 1 atm = 1.0x10-5 N m-2

Velocity of light, c =3.0 x 108 m/s

1 Faraday = 96,500 C mol-1

Answer a total of **five (5)** questions

1. (a) (i) State the partition law. **(11/2 marks)**

(ii) Explain three applications of distribution law. **(3 marks)**

(iii) A solution of 6 g of substance X in 50 ml of aqueous solution is in equilibrium at room temperature with a solution of X in diethyl ether (ethoxyethane) containing

108 g of X in 100 ml. Calculate the mass of X extracted by shaking 100 ml of an aqueous solution containing10 g of X with:

* 100 ml of ether  **(4 marks)**
* 50 ml of ether twice at room temperature **(4 marks)**

1. Explain the meaning of miscible solution **(11/2 marks)**
2. Ethanol and water form an Azeotropic mixture which boils at 78.1 °C of 95.6% ethanol at S.T.P. The boiling point of pure water and pure ethanol are 100°C and 78.4°C respectively.
3. Draw a temperature versus mole fraction phase diagram of ethanol and water solution. **(2 marks)**
4. Why it is not possible to get 100% pure ethanol by fractional distillation of a mixture of ethanol and water? **(2 marks)**
5. After having obtained a 95.6% ethanol-water mixture how could you get higher percentage of ethanol solution? **(2 marks)**
6. (a) Explain the meaning of the following term;
7. Zero order of reaction **(2 marks)**
8. Rate law **(2 marks)**
9. Energy profile  **(2 marks)**
10. A first order reaction takes 100 minutes to be complete for 60%. Find the time when 90% of the reaction will be completed. **(6 marks)**
11. Given an electrochemical cell;

Zn/Zn2+// Ag/Ag+.

Calculate the equilibrium constant at 298K for the overall reaction using the following standard reduction potential given below;

Zn/Zn2+ E0(volts)= (-0.762)

Ag/Ag+ E0(volts) = (0.800)  **(8 marks)**

1. (a) (i) A chemist needs a buffered solution of propanoic acid, CH3CH2COOH and its salt, CH3CH2COONa . Calculate the ratio of (CH3CH2COOH)/ (CH3CH2COONa) yielding a pH of 4.30. Ka for propanoic acid is 1.3 x 10-5**(5 marks)**
2. A litre of solution containing 0.1 mole of CH3COOH and 0.1 mole of CH3COONa provides a buffer of pH of 4.74. Calculate the pH of solution after the addition of 0.02 mole NaOH. Use Ka (CH3COOH) = 1.8 × 10-5 **(5 marks)**
3. Briefly explain five applications of buffer solution. **(5 marks)**
4. Write the conjugate acids for the following Bronsted bases:
5. NH2- **(1 mark)**
6. NH3(01mark)
7. HCOO-(01mark)
8. Identify the conjugate bases for the following Bronsted acids:
9. HF  **(1 mark)**
10. HCO-3 **(1 mark)**
11. (a) Describe three distinguished characteristics of S- block elements of the periodic table.

**(6 marks)**

1. Justify on the following facts:
2. Lithium on being heated in air mainly forms the monoxide and not the peroxide.

**(2 marks)**

1. An aqueous solution of sodium carbonate gives alkaline tests. **(2 marks)**
2. Sodium is prepared by electrolytic method and not by chemical method.

**(2 marks)**

1. Describe the shapes of BF3 and BH-4 and identify the type of hybridization of boron in these species. **(2 marks)**
2. Give reason(s) for the following observations:
3. Both sodium and hydrogen occur in group IA of the periodic table, yet the melting point of sodium chloride is 8000C while that of HCl is -114°C.

**(2 marks)**

1. Sodium chloride is soluble in water but not in benzene. **(2 marks)**
2. Although both oxygen and sulphur are in the same group of the periodic table, the hydride of oxygen (H2O) is a liquid but the hydride of H2S is a gas at room temperature. **(2 marks)**
3. (a) Organic compounds may sometimes occur in mixtures. In order to identify them chemical tests are carried out. How will you distinguish each of the following pairs of organic compounds?
4. Methanol and ethanol **(1 mark)**
5. Benzyl chloride and chlorobenzene **(1 mark)**
6. Propan-1-ol and propan-2-ol **(1 mark)**
7. N-butylamine and diethylamine **(1 mark)**
8. A compound (A) C5H10O forms a phenyl hydrazone and gives a negative tollen’s reagent and lodoform tests. On reduction with Zn/Hg, Compound A gives n-pentane. Write down the structure of the compound (A) and the reaction. **(8 marks)**
9. Account for the following observations:
10. Be is in period two and group two while Al is in period three and group three but the properties of their compounds resembles in most aspects.
11. Ba and Mg are in group two elements but Mg (NO3)2 does not impart colour to the Bunsen burner flame while Ba (NO3)2 does.
12. The acidity of the hydrides in group seven increases down the group.

**(3 marks)**

(d) Explain the following observations:

(i)Zinc and iron are in d- block elements but iron can be magnetized while zinc cannot.

(ii) Iron II sulphate is green while zinc sulphate is white **(5 marks)**

1. (a) Briefly explain the following and give one example for each
2. Natural polymer **(1 mark)**
3. Thermoplastic polymer **(1 mark)**
4. Thermo setting polymer **(1 mark)**
5. Write the monomers which are used to get the following polymers.
6. Polyvinyl chloride **(1 mark)**
7. Teflon **(1 mark)**
8. Bakelite **(1 mark)**
9. (i) Why is cationic polymerization preferred in the case of vinylic monomers containing electron donating groups? (2 marks)
10. Why should one always use purest monomer in free radical polymerization? briefly explain  **(2 marks)**
11. Differentiate homopolymers and copolymers basing on the mode of polymerization. Give one example for each type **(3 marks)**
12. (i) How do polyacrylates differ from polyesters? Explain Briefly **(2 marks)**
13. Write structure of a reagent used for initiating a free radical chain reaction, how does it act? **(2 marks)**
14. Write equations for the synthesis of polymethyl methacrylate, polyacrylonitrile  **(3 marks)**